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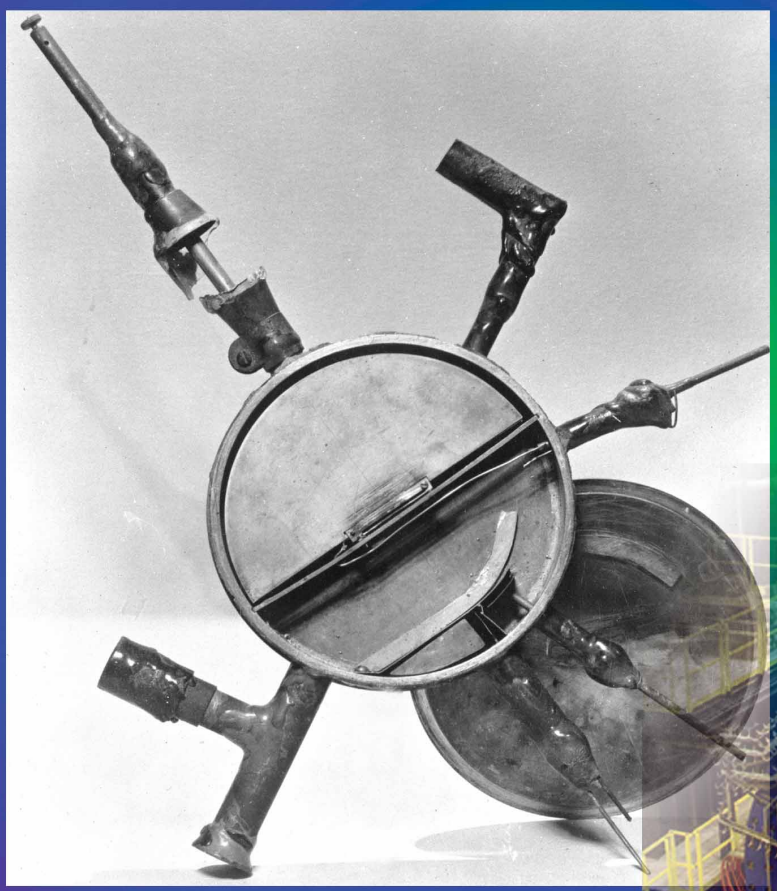

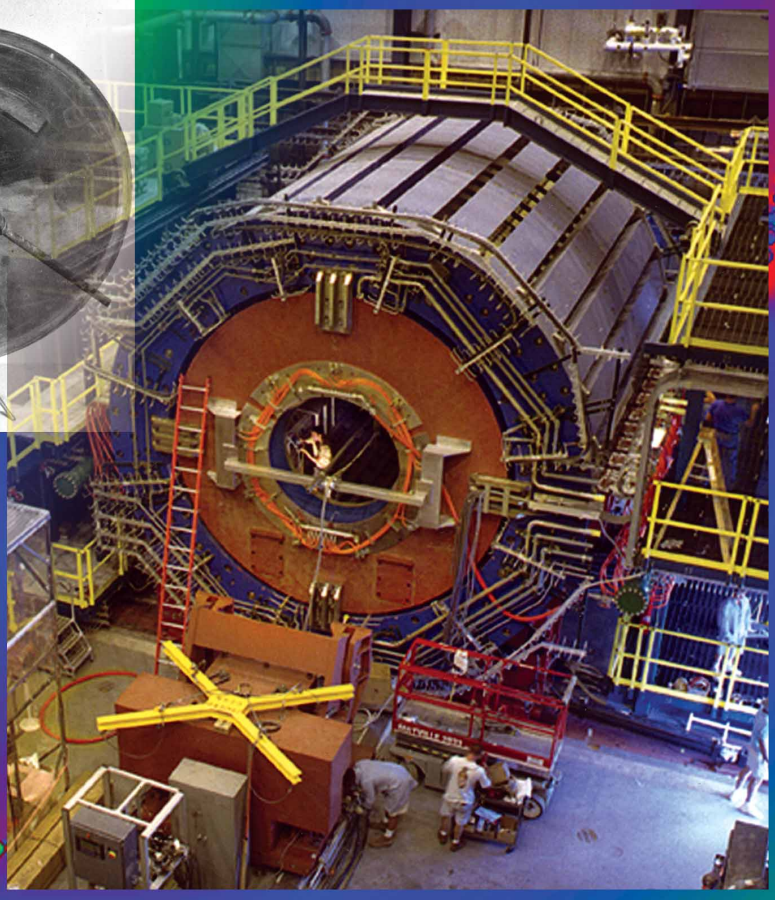

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In-situ Electrochemical Experiments at the Synchrotron: Applications in Battery Research.

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Synchrotron radiation is more and more used nowadays to study advanced materials, including battery electrodes. We are investigating the fundamental mechanisms of battery failure using electrochemical and X-ray techniques at synchrotron radiation sources. Techniques used in this project include battery cycling (the charging and discharging of batteries at a constant current), and X-ray absorption spectroscopy. X-ray absorption spectroscopy is the probing of electrodes with X-rays of various wavelengths to obtain an entire spectrum of Manganese (Mn), a major constituent studied in our battery electrodes. From these spectra we can observe the chemical shift in Mn during battery operation (oxidation state) and determine the changes in the bonding lengths and coordination of atoms in manganese oxide. From battery cycling, we can determine the capacity and power density of the batteries, cycle life of the batteries, and degradation of the electrodes in the batteries. To assign structural and electronic changes in the electrodes as obtained by the X-ray techniques and to the charge and discharge conditions, experiments have to be made under strict potential control by an accurate data acquisition system. A computer controlled portable data acquisition system was built entirely for this purpose with LabVIEW. This research is an ongoing process and as of now, we are at the stage of establishing novel techniques.

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